

13

Our^I Past 10,000 Years

AGRICULTURE, POPULATION, BIOLOGY



Once humans began practicing agriculture, corn, wheat, and rice became three of the main crops they cultivated. The movement from procuring wild food to producing food has had many varied outcomes for modern *Homo sapiens*, including changes in health, well-being, and lifestyle.

BIG QUESTIONS

1. **When, where, and why did agriculture first develop?**
2. **How did agriculture affect human living circumstances?**
3. **How did agriculture affect human biological change?**

One of my greatest disappointments as a child was when my dentist told me my teeth were crooked and had to be straightened. My dentist was able to fix the problem by removing a lower third premolar on each side of my mandible, making room for other teeth to grow without crowding taking place. Most of my friends were not so lucky: the problems with their teeth required years of treatment, which involved painful throbbing of their mouths after each orthodontic visit (in which the braces were tightened as in some kind of medieval torture); a tinny flavor no matter what was eaten; food stuck in the wiring; and, perhaps worst of all, dietary restrictions (no popcorn, no gum, no caramel, nothing sweet and sticky)—in short, none of the wonderful comforts of “civilization” (Figure 13.1).

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Tooth crowding and malocclusion—improper fit of the upper and lower teeth, sometimes called *underbite* or *overbite*—are commonplace around much of the world today. Millions of people have crowded, misaligned teeth. This phenomenon has not always been the case, however. It has occurred mostly within the past 10,000 years—the Holocene. What happened?



"Relax, Billy, they're just braces, even I had them when I was your age."

(a)



(b)

FIGURE 13.1

Braces (a) Straightening teeth has become so common that orthodontics in the United States is a multibillion-dollar industry. Among the braces used are (b) the standard wires and apparatus, both stainless steel. ([a] www.CartoonStock.com)

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This development, not present for most of human evolution, came about because of changes in *what* humans ate and *how* they prepared food for consumption. Namely, they switched from a diet of wild plants and wild animals to a diet partly based on domesticated plants and domesticated animals. In other words, in many areas of the world humans gave up, at least in part, hunting and gathering for agriculture (farming). They shifted from *foraging* for their food to *producing* their food. Moreover, pottery—invented first by hunter-gatherers 10,000 years earlier in Late Pleistocene China—took on a new function; namely, boiling grains into soft mushes. As a result of this technology, foods became much softer than ever before. These changes in what was eaten and how it was prepared reduced the stresses on humans' chewing muscles. This reduced stress, like that on any muscle, also reduced the underlying bone. Basically, we have smaller jaws because our ancestors began eating softer foods. (Remember Wolff's Law, discussed in chapter 5: bone develops where it is needed and recedes where it is unnecessary.)

Tooth size is under stronger genetic control than is bone size, and as a result, tooth size is less affected by the environment. And as a consequence, humans' teeth had much less room to grow, resulting in the remarkable increase in crowded and poorly occluded teeth (**Figure 13.2**). The malocclusion epidemic, part of recent human evolution, is one of

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